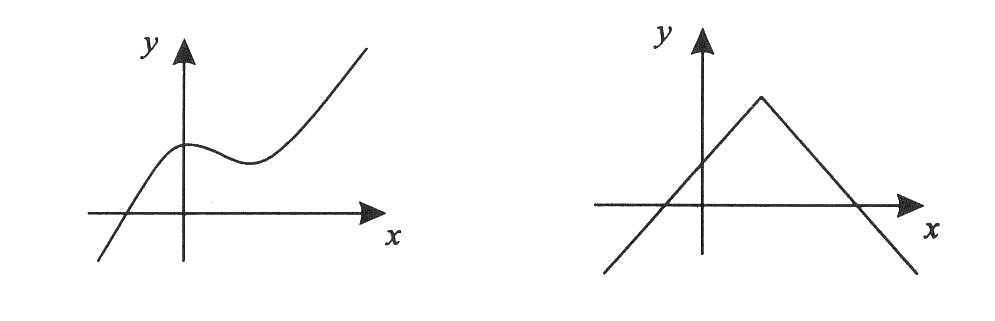
**Continuity of Functions**

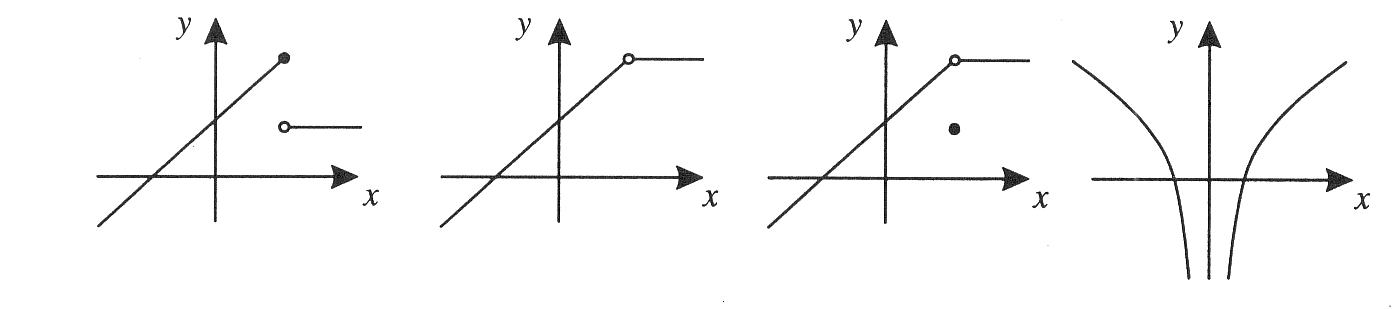
A function is **continuous** if its graph can be drawn without lifting the pen off the page, i.e. there are

**no breaks** in it.

The graphs below are of continuous functions:

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The graphs below are of **discontinuous** functions:

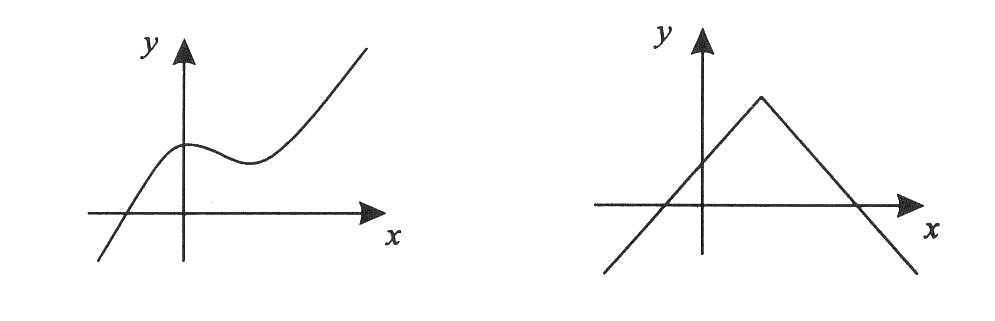
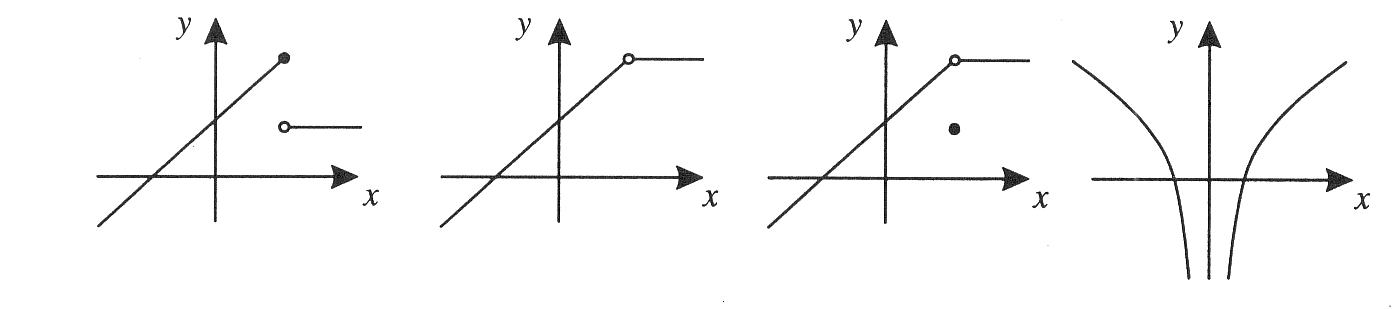
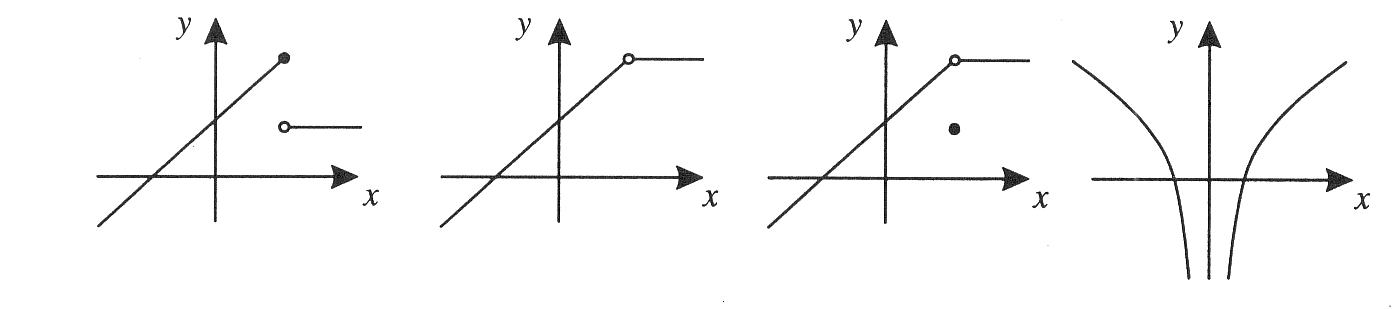


**Differentiability of Functions**

A function cannot be differentiated at a point if:

* It is not continuous at that point
* There is a sharp ‘corner’ or ‘point’ in the curve at that point
* The function does not exist at that point i.e. there is a ‘hole’ or a ‘break’.

The functions below are all not differentiable at due to breaks or sharp corners in the curve,

which have been circled. 

***a***

***a***

***a***

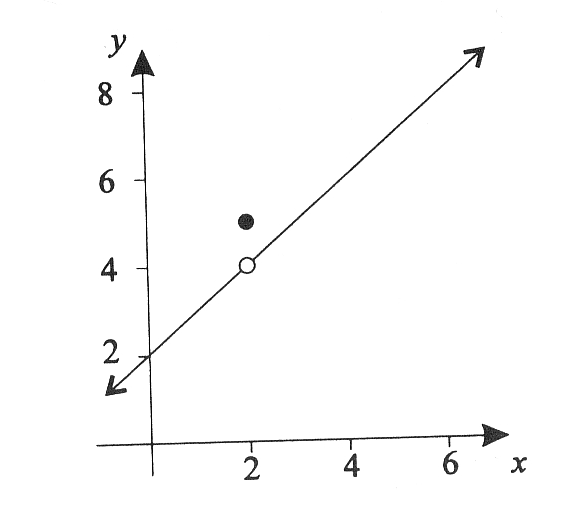
Ex Ex 5.8 pg 79 - 80

***a***

***a***

**Graphs and their limits**

The limit of a graph at point is the **y-value** the graph **approaches** from either side of point .

1. The limit for the graph on the right at point x = 2 is 4.

This can be written as .

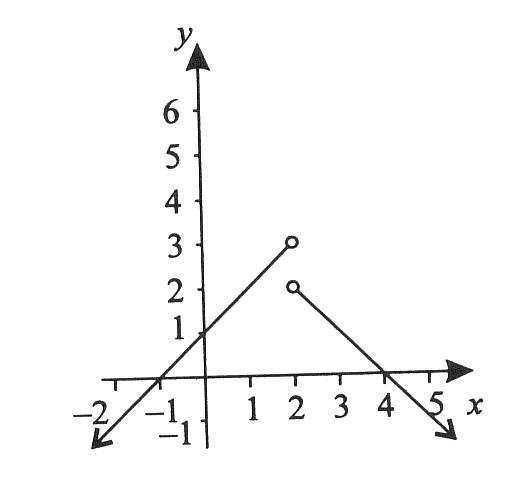
A limit exists at x = 2, even though there is a ‘hole’ exactly

at x = 2. The function need only **approach** the same y-value

from either side of point to have a limit a point , and the

limit is the y-value the function **approaches**, not the actual

value f(2) = 5.



1. The limit for the graph on the right at point x = 2 does

not exist.

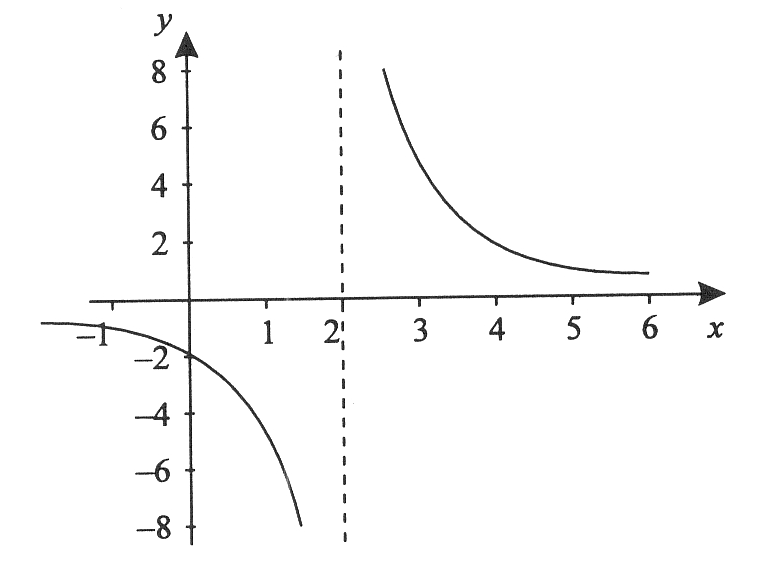
There is a vertical gap at x = 2. The function approaches

the y-value of 3 to the left of x = 2, but approaches the

y-value of 2 to the right of x = 2. Therefore, no limit exists

since the function does not approach the same y-value on

either side of x = 2.



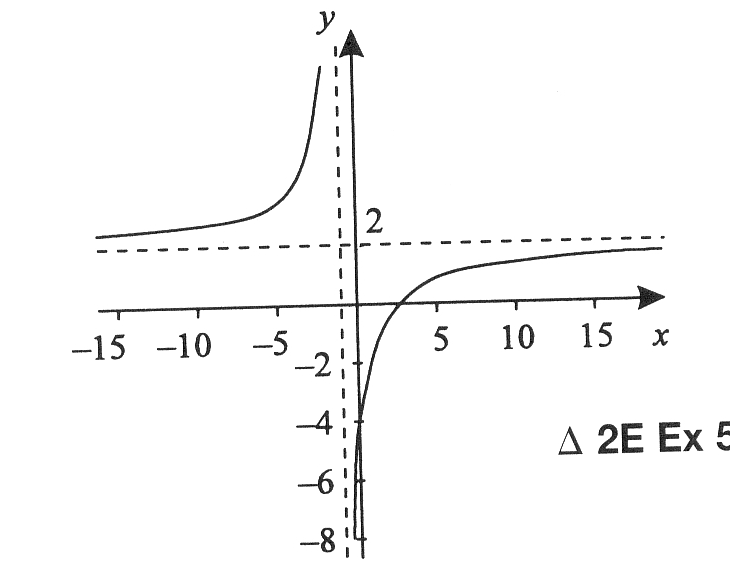
1. The limit for the graph on the right at point x = 2 does

not exist.

The graph has a vertical asymptote at x = 2. The function

approaches to the left of x = 2, but approaches

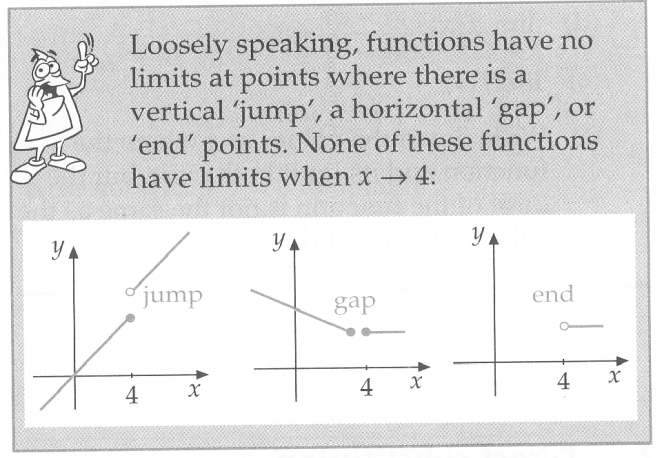
to the right of x = 2.



1. The limit for the graph at point x = -1 does not exist.

The limit for the graph as is 2.

The limit for the graph as is 2.



Ex Ex 5.8 pg 79 - 80